Massachusetts Department of Public Health
Division of Food and Drugs and the State Laboratory Institute
305 South Street
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Food Sample Submission Information and Procedures

Introduction

The Division of Food and Drugs (DFD) and the State Laboratory Institute (SLI) works with regulatory agencies to aid in the investigation of suspect foodborne illness complaints, food injury complaints and food adulteration complaints. The two labs at the SLI that analyze food samples are the Food Microbiology Laboratory (Food Lab) and the Analytical Chemistry Laboratory (also referred to as the Environmental Lab). Each laboratory has its own sphere of expertise and range of tests that it can perform. This guideline will describe the capabilities of both laboratories and outline the proper indications and procedures for submitting samples. This guideline is intended to provide state and local regulatory officials with an introduction to these two laboratories and to provide basic information for health agents to use when submitting samples. Because many situations are unique and often complex, the Division of Food and Drugs must be contacted prior to submitting all samples.

Important Phone Numbers

Division of Food and Drugs: 617-983-6712 617-983-6770 (fax)
Food Microbiology Laboratory: 617-983-6610
Analytical Chemistry Laboratory: 617-983-6653 or 617-983-6658

Food Microbiology Laboratory

Before submitting samples, contact the Division of Food and Drugs at 617-983-6712.

Available Tests

When submitting samples for analysis, it is the responsibility of the submitter to request the appropriate tests. In order to know what tests to request, the investigator should consider epidemiological information, results of the environmental investigation and results of clinical testing if available. Chapter 2 of the Foodborne Illness Investigation and Control Reference Manual (http://www.state.ma.us/dph/fpp/refman.htm) contains information which can aid in this determination. In addition, the DFD must be contacted prior to submission and can help determine which tests would be appropriate. The following is a list of the tests which the Food Lab has the capability to perform.

Procedures involving "Counts":

- Standard Plate Count (SPC), also called Aerobic Plate Count (APC)
- Total coliform count
- Fecal coliform count, if total coliforms are detected

- Staphylococcus aureus count
- Bacillus cereus count
- Viable yeast count
- Viable mold count
- Clostridium perfringens count
- Total E. coli count (special request)

Procedures involving detection of pathogens (viable organisms):

- Clostridium botulinum (special request)
- Salmonella spp.
- E.coli O157:H7
- Campylobacter spp.
- Shigella spp.
- Vibrio spp.
- Yersinia spp.
- Listeria monocytogenes
- Shiga toxigenic E. coli other than O157:H7 (STEC) (special request)

Procedures involving the detection of toxins:

- Paralytic Shellfish Poisoning (PSP)
- Botulinal toxin (special request)
- Shiga toxin (special request)

Procedures involving sterility confirmation:

- Canned goods
- Infant food

Procedures involving filth analysis:

- Extraneous material
- Insect identification
- Phosphatase test for rodent droppings
- Rodent urine (ultraviolet light)

Note: The Food lab cannot test for viruses or parasites in food or beverages.

When to test:

Microbiological testing:

Not all food samples collected in response to a complaint are appropriate samples for microbiological testing. In general, the following are appropriate samples for analysis:

- samples associated with investigations of suspect foodborne illness involving two or more people;
- samples associated with a single *laboratory confirmed* case if the suspect food was eaten within the incubation period;
- samples associated with any confirmed or suspect case of botulism;
- raw ground beef or meat, if associated with a confirmed case of *E. coli* O157:H7;
- suspect illnesses related to baby foods or formulas.

Bacterial testing is most appropriate when there is a high index of suspicion that the food sample in question did in fact make the complainant ill. In situations in which a clinical laboratory confirmed the diagnosis, the food sample should be tested for that organism. Such laboratory confirmed cases provide the best chance for determining whether the suspect food was the cause of the illness.

Unfortunately, most of the foodborne illness complaints are not laboratory confirmed, and therefore sample testing is more challenging. In unconfirmed cases, the investigator must make an educated guess as to the most likely cause of the illness and request that the Food Lab perform the appropriate test(s). The DFD and/or the Food Lab must be consulted prior to submitting the food sample for analysis to assist in determining the appropriate tests.

When analyzing samples associated with an unconfirmed illness, the Food Lab will always do a Standard Plate Count (SPC) and Total Coliform Count. If coliforms are found in the sample, then a fecal coliform test will also be performed. These tests can never definitively determine whether the food sample in question caused the illness because these tests are not specific for pathogens. At best, these tests provide indirect evidence for poor food handling practices and/or contamination of food product. When evaluated in conjunction with the findings of an environmental investigation, a high SPC or coliform count may support the conclusion that poor food handling practices occurred. Because complaint samples are usually consumer samples leftover from the suspect meal, there is always the possibility that growth of aerobic bacteria and/or coliforms occurred after the food left the food service establishment and before it arrived at the food lab. It is impossible to draw any conclusions about where contamination and growth may have occurred without a thorough environmental investigation and detailed chain of custody information.

It is always preferable to test a sample of the food that the complainant actually ate. If the consumer's leftover sample is not available but the establishment has food that was prepared the same day, that would also be an acceptable sample. It should be noted that testing of raw foods is not recommended unless a specific pathogen is confirmed or strongly suspected or there is good reason to suspect *E. coli* O157:H7. (Raw ingredients, especially meats, contain relatively high levels of non-pathogenic bacteria. Non-specific analyses such as SPC and

coliforms are not likely to be informative.) Because such foods are typically cooked, finding high SPCs or coliforms in the raw product is usually of no consequence.

The Food Lab will test any baby food or formula which is associated with a foodborne illness complaint. Even if the case is not laboratory confirmed, the vulnerability of this population and the potential serious consequences of contamination warrant taking all such complaints very seriously.

Filth analysis:

Filth analysis involves examining a food for the presence of foreign objects. The Food Lab will do a filth analysis even if no injury or illness has occurred. The suspect object, however, should be of a serious enough nature that injury or illness might have occurred. In addition, when the presence of the object indicates a violation of good retail practices or good manufacturing practices, it may be appropriate to submit the food for examination.

If the identity of an object is obvious, such as a band-aid or a needle, the local health agent can attest to the identity of the object and submission of the object to the Food Lab for verification should not be necessary. If the local health agent feels strongly that a second opinion is warranted, then the sample may be submitted to the Food Lab after consultation with DFD or the lab.

Note:

- The Food Lab cannot test for the presence of blood in or on food or foreign objects.
- The Food Lab does not test for HIV or hepatitis viruses in or on food or foreign objects.

Procedure for Collecting Samples:

- If possible, leave the food sample in its original container or in the container in which the consumer has placed it. This will reduce the chances of introducing additional contamination to the sample. However, if the sample is very large or the container is not secure, the sample or a portion of it will need to be transferred to a new container.
- Use sterile containers and do not touch the inside of the container. However, if a sterile container is not available, any clean container which can be tightly sealed may be used.
- Use sterile utensils, tongs, spoons, etc, if available. If not available, other clean utensils can be used.
- Make sure caps are tight to prevent leakage.
- If multiple samples are suspected, such as the various components of a meal, pack each separately. Do not commingle individual samples.
- Whirlpack bags can be used for solid foods but should not be used for liquids.
- Collect adequate amounts: 100-150 grams or milliliters (4-6 oz) if available.

- When collecting liquid samples, fill the container no higher than ¾ full in order to allow for proper mixing of the sample.
- When collecting water from spigots, let the water run for 2 minutes before collecting.
- Label all samples clearly with identifying information. Use waterproof ink and labels.
- If the sample is refrigerated, keep it cool (<41° F) during storage and transportation. Gel packs are usually adequate for transporting samples.
- If the sample is frozen, keep it frozen.
- If a perishable food is at room temperature when collected, refrigerate and keep cold (< 41° F). Any food submitted for microbiological analysis should be kept refrigerated until submitted including maintaining temperature control during transport.
- If a sample for microbiological testing cannot be submitted for several days the sample can be frozen. It should be kept in mind that freezing may injure bacterial cells and can hinder the ability to detect microorganisms and is not generally recommended.

Procedure for Submitting Samples:

- Call the DFD prior to submitting sample.
- Samples must be submitted by the local board of health. Consumers should never be instructed to drop off the samples at the SLI.
- Maintain temperature control of the sample.
- Fill out the sample submission form and give to a Food Lab bacteriologist when the samples are dropped off. Do not just leave them in the lab!
    - Indicate which tests are requested.
- Chain of custody should be described on a separate form (i.e. the narrative page of an inspection report form).
    - Indicate when (date and time), where and from whom the sample was obtained.
    - Describe where the sample had been kept and what type of container it had been stored in- (i.e. plastic bag in consumer's refrigerator).
    - Describe where and how the sample was held while in the custody of the board of health and how it was transported to the lab (i.e. if put in different container, if held in the refrigerator in the office, if placed in cooler with gel packs for transport, etc.).
- If the food sample is associated with a suspect illness, submit a Foodborne Illness Complaint Worksheet. The Worksheet can either be submitted with the sample or faxed to the DFD **prior** to sample submission.
- The sample must be submitted ASAP.
    - It is preferable to submit the sample in-person or by courier.
    - Overnight mail can be used if the sample is packed with sufficient gel packs to keep it cool (sample should be double bagged to insure it does not become contaminated during transport).

- Regular mail is not appropriate for any sample being submitted for microbiological testing. (Regular mail may be acceptable for filth evaluation in non-perishable foods.)

- If the sample is a pre-packaged food or beverage, obtain the name and address of the manufacturer and/or distributor. Product codes, expiration or sell-by dates and size and type of packaging are also needed to determine which lots might be affected. (UPC codes are not sufficient. Although they identify the product, they do not contain lot-specific information about when and where the product was made. The lot-specific codes are usually stamped or embossed on the package by the manufacturer.)
- When the suspect sample is a pre-packaged food or beverage, an unopened container, preferably of the same lot number, should also be submitted.
- **Note: If the correct sample submission procedures are not followed, the Food Lab may not be able to analyze the food sample.**

Analytical Chemistry Laboratory (Environmental Lab)

Before submitting samples, contact the Division of Food and Drugs at 617-983-6712.

Available Tests:

The following is a partial list of the tests which the Analytical Chemistry Lab can perform. It is the responsibility of the person submitting the sample to request the appropriate tests. Because food chemical analysis is very complex, the submitter must consult with the DFD prior to submitting a sample. **Samples will not be accepted without prior approval.**

- Metals and elements in foods and beverages
  - copper
  - lead
  - arsenic
  - mercury
  - others as needed
- Industrial chemicals
  - Pesticides in fruit and vegetables
    - organophosphates
    - organochlorines
    - carbamates
  - Rodenticides
  - Polychlorinated biphenyls (PCBs)

- Petroleum distillates (fuels)

- Unusual tastes or odors in foods and beverages
  - Volatile organic compounds (VOCs)
    - Solvent-like odors in food or beverages
      - Benzene
      - Ethylbenzene
      - Toluene
      - Xylene
      - Others as needed
  - Surfactant screen
    - Anionic or cationic determination of surfactant
- Preservatives in Beverages (labeling issues)
  - Benzoic acid
  - Sorbic acid
- Sulfite testing in food products
- Biogenic amines (histamine) testing in fish for scombroid poisoning
- Seafood toxins
  - PSP
  - Domoic acid
- Testing products for evidence of tampering
  - Organoleptic testing
  - Pill identification (medications)
  - Chemical spot tests
  - Volatile and semi-volatile comparisons
  - pH testing

When to test:

- Injury or illness due to suspect foreign chemical substance in food: **ONE CASE** is often enough to warrant an examination
- Pills or capsules found in food or beverage
- Unusual chemical odor or taste with or without injury or illness
- Finfish samples associated with histamine (scombroid) poisoning
- Shellfish associated with suspect PSP or domoic acid poisoning

Before submitting samples, local health agents must first call DFD or the Analytical Chemistry Lab to discuss the testing procedures and correct submission of samples. The lab cannot do blind screens so samples must be submitted with enough information to narrow the possibilities of things for which to test. The lab will need a copy of the complaint with all relevant case and environmental information. If the complaint involves an illness, then the Foodborne Illness Complaint Worksheet should be completed and submitted with the sample. There is no sample submission form for the Analytical Chemistry Lab, therefore a detailed narrative, including chain of custody information, should be submitted with the sample.

When chemical contamination is suspected, a precise description of the taste and smell of the food or beverage can provide useful clues to the identity of the contaminant. When illness or injury results, a full description of the onset time, symptoms and any medical diagnosis also provide important information. In some cases, such as histamine poisoning, the symptoms experienced by the complainant can be diagnostic.

In addition, a thorough environmental investigation is necessary and can be very helpful. The environmental investigation should focus on possible sources of chemical contamination. It is also very useful to be able to compare the foreign substance in the food with chemicals found on the premises where the food was prepared or stored. Samples of possible chemical contaminants should be submitted with or soon after submission of the suspect food.

Procedure for Collecting Samples

- Samples should be kept in the original container if possible. If the sample cannot be submitted in the original container or the original container cannot be shut tightly, consult the lab for information on what type of container is appropriate. (Some samples will need to be stored in glass and some in plastic depending on the suspect contaminant)
- Samples should be kept in containers that can be sealed to prevent leakage of liquids or loss of volatile substances.
- Relevant control samples should be collected (see below).
- Samples should be submitted as soon as possible. If there is likely to be a delay, consult the lab about whether the sample should be frozen or refrigerated. If the lab or DFD cannot be contacted right away, put the sample in a container which can be tightly closed and place in the refrigerator.
- **Histamine:** Finfish samples for histamine testing should be kept at or below 41°F and submitted as soon as they are collected. **If there is any delay, even a few hours, the sample should be frozen.**

Procedure for Submitting Samples

For correct sample submission procedures, it is very important to consult DFD or the Analytical Chemistry Lab prior to submitting samples.

- Submit a detailed description of the complaint with the sample. Include symptoms, diagnoses, taste, odor and any other descriptive information.
- Submit chain of custody information.

- Samples must be submitted by a representative of the local board of health. Consumers should never be instructed to drop off the samples at SLI themselves.
- Submit the results of the inspection of the implicated retail establishment where the food was prepared or stored.
- Submit control samples (see below).
- Maintain temperature control of the sample.
- NOTE: If the sample is a pre-packaged food or beverage, obtain the name and address of the manufacturer and/or distributor. Product codes, expiration or sell-by dates and size and type of packaging are also needed to determine which lots might be affected. (UPC codes are not sufficient. Although they identify the product, they do not contain lot-specific information about when and where the product was made. The lot-specific codes are usually stamped or embossed on the package by the manufacturer.)
    - When submitting pre-packaged foods, provide an unopened package of the exact same product in the same type and size package and from the same lot number as the suspect product. This sample is analyzed to determine if there is a contamination problem at the manufacturing facility.

Control samples:

The Analytical Chemistry Laboratory needs control samples to run many of its tests and will not analyze samples if a control is not provided. For pre-packaged foods, a control sample is an unopened package of the suspect food which is very likely to be free of contamination. The control must be the exact same product in the same type and size package as the suspect food. The control sample should be from a different lot number than the suspect sample.

If the suspect food is not pre-packaged, then the control sample should be obtained from the same establishment which produced the suspect sample. The control should be the exact same product as the suspect food but from a different batch.

Whenever fish is submitted for histamine testing, a control piece is always required. If the control is from the same establishment as the complaint, it should be from a different lot than the suspect sample. If the establishment does not have any fish from a different lot, obtain the control from a different establishment.

Controls are necessary because foods and beverages are chemically complex. The test results from the suspect sample are compared against the results from the control sample. Differences between the two samples would be considered significant. In addition, the control provides evidence that any unusual findings in the suspect sample are not due to chemist's misinterpretation or instrumental error but are in fact true findings.

Note on Testing for Allergens:

With the exception of sulfites, the State Laboratory does not have the capability to test for allergens in food. While allergic reactions can be serious and are a public health concern, they do not pose any regulatory issues unless the concern is that a food has been mislabeled. Failure to declare the presence of peanuts, soybeans, milk, eggs, fish, crustaceans, tree nuts, or wheat is a major concern because these eight allergens are thought to cause over 90% of all allergic reactions from food. If such a situation is suspected, the DFD should be notified immediately. If necessary, samples may be able to be sent to an outside lab for testing.